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"The Role of Federal Lands In Combating Climate Change"

Chairman Grijalva and members of the Subcommittee, my name is Dominick DellaSala. I am the Chief Scientist at the National Center for Conservation Science & Policy in Ashland, Oregon (www.nccsp.org) and President Elect of the Society for Conservation Biology (SCB, www.conbio.org), North America Section. SCB has a global membership of over 11,000 scientists and resource managers; two-thirds of whom reside in the U.S.

Work by SCB scientists and my organization clearly demonstrate that the accumulation of heat-trapping greenhouse gases (GHGs) in the global atmosphere creates and exacerbates risks to biological diversity and ecosystem services (*Conservation Biology* 2008, Exhibit A). This dangerous interference with the Earth's climatic system imposes unmitigated and unacceptable costs on present and future generations. Thus, Congress and the Obama administration should give this issue top priority not only for the environment but with regard to its implications for national and economic security (Pumphery 2008), human health, and quality-of-life.

Federal lands are key to mitigating climate change effects as well as providing the nation with irreplaceable biological diversity, clean water, fish and wildlife habitat, recreation, and other economic values. Federal lands often contain large blocks of intact and functional ecosystems with viable fish and wildlife populations most capable of adapting to rapid climate change in the coming decades. Therefore, in an era of increasing climate disruptions, federal lands are our best hope for conserving the ecosystem services upon which society depends. Managing for the restoration and conservation of those ecological systems must become the clear and primary goal of federal agencies. To ensure this goal is met, both the Forest Service and Bureau of Land Management (BLM) must have the same mission so there is continuity of management across all 457 million acres of publicly owned lands.

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In my testimony, I offer four main points and fourteen closing recommendations on what Congress and the Obama administration can do to combat climate change on federal lands. While the focus of today's hearing is on federal lands, federal lands should not be used as an offset for unsustainable practices on nonfederal lands. We also need to take steps to reduce the impacts that activities on nonfederal lands have on ecosystems and greenhouse gas (GHGs) emissions.

MAIN POINTS

(1). The nation needs a goal with early and aggressive efforts to reduce GHG and related particulate emissions to reach an atmospheric concentration of 350 parts per million (ppm) CO2 equivalent target and a national implementation plan that addresses all major sources of such emissions by requiring contributions from every federal agency.

(2). Congress should provide clear direction to the Forest Service and the BLM to adopt new approaches that optimize carbon capture and storage and minimize GHG emissions from land management activities, including energy extraction, on public lands.

(3). Federal agencies should adapt natural resource management to the changes brought on by climate change by adopting a 3-Rs approach – Reduce existing stressors to ecosystems and increase Resilience and Resistance of species and ecosystems to climate change.

(4). Federal agencies need clear direction to prioritize the preservation and restoration of ecological integrity of public lands so that these lands will continue to provide Americans with biological diversity and other sustainable ecosystem services such as abundant clean water, carbon sequestration and storage, air filtration, flood control, and recreation.

Each of these main points implies fundamental shifts in how the agencies are currently doing business. If we do not take these steps, the forests, rivers, and coastal zones we Americans cherish will experience unprecedented losses of biological diversity, ecosystem services and productivity, and recreational values.

I. The nation needs a goal with early and aggressive efforts to reduce GHG and related particulate emissions to reach an atmospheric concentration of 350 (ppm) CO2 equivalent target and a national implementation plan that addresses all major sources of such emissions by requiring contributions from every federal agency.

Just months after the release of the IPCC report of 2007, this Committee heard from Tony Westerling that climate change appeared to be making western fires more severe than most had expected (Westerling et al. 2006). Geophysicists, climatologists, and other experts, including NASA's James Hansen and others (Hansen et al. 2008) announced findings that the pace of climate change and its impacts had accelerated faster than projected by the IPCC, recommending **$C0_2$ levels in the atmosphere be reduced from the current 387 to 350 ppm** through reduced GHG and soot emissions, reforestation, and agricultural reforms. To reiterate, "*if the present offshoot of this target is not brief, there is the possibility of irreversible catastrophic effects"* (Hansen et al. 2008).

Without a national goal for reducing GHG emissions and an accompanying implementation plan, our nation will find it most difficult to successfully address the threat of climate change. It is not sufficient to simply urge or require federal agencies to act. We must give them a clear direction for action – a goal, a process, target, and a plan. A national implementation plan would provide benchmarks against which land use

plans and federal actions can be evaluated in addition to those in existing law. For example, drilling to extract natural gas increases GHG emissions but may produce lower emissions compared to other energy sources if it is part of a *comprehensive national plan* that selects alternatives with low emissions (Exhibit B) or combinations of demand and supply measures that result in the lowest practicable emissions and least ecologically disruptive impacts. In the absence of such a plan, it is more difficult to fully evaluate GHG emissions of federal actions and to require appropriate choices. **Thus, Congress should redirect the Forest Service and the BLM to adopt and then coordinate and implement a comprehensive plan along with the traditional implementation planning already part of all federal actions and land-use planning.**

We need a national strategy for federal lands that is science-driven, adaptive in its approach, and comprehensive in jointly addressing mitigation (i.e., reducing GHG emissions and increasing sequestration) and preparation (i.e., reducing the vulnerability of people and ecosystems to the impacts of climate change) alongside ecosystem services and biodiversity goals. **As a first step**, **this Committee could request that the Secretaries of Interior and Agriculture report back on what authorities they already have under existing laws and regulations to respond to climate change and how they plan to use them.** In most cases, agencies do not need new authorities to take action. However, they may need congressional oversight to ensure they explicitly consider the extent to which their actions drive climate change and the consequences of climate change for the cost and efficacy of their plans and projects. This is a matter of good governance and fulfilling existing mandates and authorities that set performance goals for agencies, including but not limited to the National Environmental Policy Act (NEPA), Clean Water Act, Endangered Species Act, Federal Land Policy and Management Act (FLPMA), and Clean Air Act. Agencies must ensure that their plans and programs will be successful under currently foreseeable climatic conditions (i.e., conditions that are more likely to be fundamentally different from the last century).

Further, to examine the efficacy of current regulations and laws, Congress should convene a Committee of Scientists to build on prior efforts used to examine promulgating regulations on national forests (COS 1999). A science committee should be tasked with determining how best to comply with existing regulations and statutes such as NEPA, the National Forest Management Act (NFMA), and the FLPMA in the context of cumulative impacts from climate change and land use.

II. Congress should provide clear direction to the Forest Service and the BLM to adopt new approaches that optimize carbon capture and storage and minimize GHG emissions from land management activities, including energy extraction, on public lands.

The current concentration and rate of increase of carbon dioxide (CO_2) in the atmosphere exceed those of the last 420,000 years (IPCC 2007). This along with emissions of several other powerful GHGs has resulted in a global average temperature increase of 0.7º C (1.3º F) over the last century. During the past several decades, we have recorded increases not only in temperature but in the number and magnitude of extreme storms,

floods, and regional droughts (IPCC 2007). Such effects already are being felt throughout the nation (e.g., Exhibit A), yet they are expected to quickly become more severe in the coming decades depending on ongoing GHG emissions and land-use practices. What we do next in response to this pending crisis will determine whether climate change impacts are merely severe or truly catastrophic.

In particular, forests both are affected by climate change and can be an integral part of the solution. Very simply, forests absorb CO_2 from the atmosphere and store the carbon from it in cellulose (wood) and soil. In this process, they convert CO_2 into oxygen that makes life possible. When forests are logged, they release the majority of this stored carbon, which then contributes to the greenhouse effect.

Our nation's forests absorb the equivalent of about 10% of our carbon emissions from fossil fuels (Smith and Heath 2007, Depro 2007). Many studies have shown that old-growth forests accumulate carbon for centuries and that these forests are not neutral holders of carbon but continue to sequester large amounts of it even as they age from 300 to 800 years (Luyssaert et al. 2008). Studies also have shown that when old trees are cut down and replaced by younger ones there is a net reduction in carbon stores (Law et al. 2004, Depro et al. 2007). Much of this stored carbon is released to the atmosphere through loss of carbon in soils, decomposition and burning of slash left on site by loggers, and shipping and processing of wood products (Harmon et al. 1990, 2001). The relatively short shelf life of most wood products exacerbates these losses. The losses are neither trivial nor compensated by fast growing, young trees; it could take hundreds of years until the new forests store as much carbon as did the original old forest (Harmon 2001). Losses of stored carbon are particularly severe on industrial forest lands where timber harvest rotations are much shorter (40-100 years) than it takes for carbon stored in the original old forest to be replenished (Harmon 2001, Luyssaert et al. 2008).

One analysis found that a hypothetical ''no timber harvest'' scenario on public lands would result in an annual increase of 17–29 million metric tonnes (MMTC) of carbon captured or sequestered per year between 2010 and 2050—as much as a 43% increase over current sequestration levels on public lands (Depro et al. 2007). In contrast, moving to a more intense harvesting policy (similar to those of the 1980s) would result in annual carbon releases per year of 27–35 MMTC between 2010 and 2050 that otherwise would have been sequestered by no harvest (Depro et al. 2007). These losses would represent a substantial decline (50–80%) in anticipated carbon sequestration associated with existing timber harvest policies.

In Oregon, coastal old-growth forests store more carbon per acre than any other forest on Earth (Smithwick et al. 2002) and they are rich in unique fish and wildlife species. However, the BLM has finalized plans to increase logging of old forests in western Oregon (Western Oregon Plan Revisions, WOPR) by more than 400% in the coming decade, largely through clearcutting. According to BLM's own analysis, in comparison to letting these old forests grow, logging would release approximately 180 million tons of carbon that is currently stored in these forests. This is equivalent to driving 1 million cars for a period of 132 years. The WOPR, in particular, is tantamount to liquidating one of

our nation's most significant carbon stores while putting the viability of several endangered species at risk and compromising ecosystem services like clean water and air. New statutory direction is needed for BLM to optimize carbon storage and fish and wildlife habitat.

In general, changing forestry and other land management practices on federal land represents one of the most powerful, and, quite frankly, least costly tools that the nation has in fighting climate change. Increasing carbon storage on and decreasing GHG emissions from federal lands is feasible across extensive areas and can be effectively implemented. To combat climate change on public lands, a fundamental shift from current forestry practices is needed that: (1) retains existing stores of carbon in mature and old forests as "carbon banks" and (2) allows or helps plantations and other intensively managed public forests optimize carbon stores by regrowing to older conditions (Harmon 2001). **The Committee also should direct federal agency divisions that influence state, private, and international forestry and agriculture to present cooperative and incentive-based plans to address climate change as federal lands should not be used as an offset for unsustainable practices elsewhere.**

III. Federal agencies should adapt natural resource management to the changes brought on by climate change by adopting a 3-Rs approach – Reduce existing stressors to ecosystems and increase Resilience and Resistance of species and ecosystems to climate change.

Reducing ecosystem stressors is the single most important change in management direction to prepare forest ecosystems for the unavoidable impacts of climate change (SCB 2008). Forests, grasslands, watersheds and other ecosystems are under increased pressure from all the needs and demands we place on them. When ecosystems are stressed, they are less capable of adapting. Stressors of ecosystems include fragmentation by roads and logging, spread of non-native invasive species by management activities (e.g., roads and livestock grazing facilitate expansion of certain weeds), unusually severe fires, high water loss (through evapotranspiration) from overstocked stands (Moore et al. 2004) and water loss from stream diversions, and fossil fuel development. Domestic livestock and its associated commodity distribution chain contribute about 18% of GHG emissions (largely methane) globally (FAO 2006) and 8% nationally (EPA 2008). Notably, methane traps 20 times more heat than CO_2 (EPA 2008). A particularly effective way to reduce livestock grazing contributions to increased GHGs as well as minimize detrimental effects on biological diversity and watershed function is to provide for the voluntary retirement of federal grazing permits. An example of this is proposed in legislation before the House pertaining to the Cascade-Siskiyou National Monument and establishment of the Owyhee Wilderness (S.22).

In contrast to degraded lands, roadless areas, mature and old-growth forests, native prairie, and protected riparian areas, have many built-in mechanisms to allow them to withstand (Resistance) and rebound from (Resilience) natural disturbances. Such areas also will be more likely to resist or be resilient to climate change (Paine et al. 1998). Congress could do two things to guide agencies in this regard: (1) direct federal agencies

to protect roadless areas and watersheds with low road densities; and (2) provide direction on restoration projects aimed at building resistance and resilience through decommissioning of failing roads, thinning of young trees in previously managed and overstocked forests, and restoring stream morphology and function in watersheds heavily degraded by logging, livestock grazing, and other land uses.

I would like to flag two issues: (1) the importance of roadless areas in climate change preparation, and (2) the limitations and benefits of thinning. Numerous studies demonstrate the importance of roadless areas to biological diversity (Strittholt and DellaSala 2001), drinking water (USFS 2000), and rural economies (USFS 2000). Roadless areas will become increasingly vital particularly in dry regions that depend on montane snow pack and as a connected landscape best capable of enabling fish and wildlife to migrate as the climate shifts.

As to thinning, millions of acres of old forests in the Pacific Northwest have been replaced with plantations that provide poor quality wildlife habitat (west of the Cascade Range, USGS 2002) or are now fire hazards (dry provinces, Odion et al. 2004). Treating these dense monocultures through variable-density thinning (with stops and gaps in thinning of trees to create structural diversity) is likely to help facilitate onset of older forest characteristics (USGS 2002), particularly if there is no net increase in the density of roads and soil damage is minimized. Thinning of small trees may reduce drought stress and fuel loads in dry forests (Brown et al. 2004), and lower fire risks where the number or severity of fires is expected to increase due to climate change (Westerling et al. 2006). However, there are tradeoffs. Fuel reduction methods typically release stored carbon from decomposition of slash left on site, burning of slash piles, transport and processing of biomass, and short shelf life of most wood products (Harmon 2001). The carbon released typically exceeds that of even the most severe fires as fires are relatively localized events compared to the extensive thinning efforts required to influence fire hazard. Thus, more carbon is removed by landscape-scale thinning than released by fires (Mitchell et al. in press). Also, most of the carbon in a burned forests remains on site, is stored for long periods as charcoal deposits, and only slowly decomposes over decades.

That is not to say we should not thin forests as part of restoration planning, but that we should not expect thinning to increase forest carbon stores. Interest of federal agencies in thinning forests is increasing, but thinning of forests should target areas where it is most needed (e.g., wildland-urban interface and overly dense young stands), while reducing ecosystem stressors by protecting large trees, soils, and riparian areas and by restoring stream hydrology that has been altered by high road densities. Agencies should use the best science in determining where to apply thinning to any given location such that this action does not undermine either climate security or ecosystem health and that its application will comply with applicable laws.

IV. Federal agencies need clear direction to prioritize the preservation and restoration of ecological integrity of public lands so that these lands will continue to provide Americans with biological diversity and other sustainable ecosystem

services such as abundant clean water, carbon sequestration and storage, air filtration, flood control, and recreation.

We are grateful for Chairman Grijalva's leadership in protecting large blocks of intact BLM lands through the National Landscape Conservation System. Intact ecosystems provide myriad ecosystem services, including flood control, water storage, carbon sequestration, and nutrient cycling (http://www.millenniumassessment.org/en/synthesis.aspx). The more ecosystems are stressed by climate change and land management activities, the more these services will be compromised. In Oregon, my organization together with the University of Oregon Climate Leadership Initiative is in the process of completing pilot projects in four river basins – Klamath, Rogue, Umatilla, and Upper Willamette (Exhibit A). In each of these basins, we are applying climate change models (IPCC 2007) and cutting edge, vegetation-climate projection models developed by the USFS Pacific Northwest Research Station MAPPS Team. Our approach may serve as a model for federal lands planning. The results of these studies indicate that striking changes to forests and rivers could occur in less than three decades. Anticipated changes include drought stress, snowpack declines of 90-95% (by 2100), greater rain-on-snow events leading to spring flooding, rapid snow melt leading to earlier onset of summertime low stream flows and warmer water, and shifts in the vegetation composition. An increase in the amount of vegetation consumed by wildfire also is probable. Such changes also could trigger the demise of threatened cold-water fish populations causing a cascade of negative ecosystem effects.

National Forests and BLM lands, in general, play an integral role in maintaining ecosystem services whether in Oregon or throughout the nation. In particular, federal agencies have numerous regulations and laws that govern the use of ecosystem services, most notably multiple use and sustained yield principles. However, in practice ecosystem services are often pitted against one another (e.g., water and carbon storage vs. timber production). For instance, intact watersheds, mature and old-growth forests, and roadless areas act as biological reservoirs, gradually storing water and slowly releasing it over dry summer months (Moore et al. 2004). High levels of logging and road building in a watershed can lead to rapid runoff, diminished hydrological functions, and losses of water storage capacity that will only exacerbate water shortages particularly in regions dependent on snow pack. As snowpack is expected to decline markedly in the coming decades (Mote et al. 2005), protecting and restoring intact areas should be a priority of federal land use planning as such lands are critical to mitigating water losses and maintaining the full range of ecosystem services.

Landscape connectivity is another critical issue that must be actively addressed to help fish and wildlife adapt to the many effects of climate change. The Forest Service and BLM need direction to undertake an aggressive program of road decommissioning to reduce the number of roads that have a high likelihood of failure, especially given anticipated increases in the number and magnitude of storms. Not only will failed roads pose a risk to human safety and reduce the quantity and quality of water, but taxpayers will pay far more to repair damages than to prevent damages. **We urge the agencies to spend at least 60% of new stimulus funds on road decommissioning.**

Failure to take action on climate change can have significant economic impacts (see Exhibit A). For instance, according to recent economic studies conducted in western states, if GHG emissions are not reduced, states like Oregon will face some $3.3 billion in annual costs in the coming decades due to climate change impacts (http://uonews.uoregon.edu/files/pmr/uploads/OR-Fnl_Rpt.pdf). This loss represents an individual cost of about 4 percent of annual household income by 2020. Total annual costs would more than triple by 2080 if insufficient action is taken to reduce emissions. Researchers projected an increase in the number and severity of seasonal droughts and floods, higher air-conditioning costs to cope with higher temperatures, higher incidence of climate-associated health problems and deaths, and more wildfires. Similar losses are anticipated for New Mexico (http://uonews.uoregon.edu/files/pmr/uploads/NM-Fnl_Rpt.pdf) and Washington (http://uonews.uoregon.edu/files/pmr/uploads/WA-Fnl_Rpt.pdf). Federal lands can help mitigate these losses if these lands are managed with sequestration, biodiversity, and ecosystem services (especially water) as a priority.

CLOSING RECOMMENDATIONS

Climate change represents the most serious threat to our natural resources and is a growing threat to the nation's security and economy. To implement the four main actions, I have provided fourteen supporting recommendations that should be considered in new legislation or administrative policies (as amended from SCB 2008):

GHG Emissions On Federal Lands:

(1). *Require full assessment, disclosure, and mitigation of the contributions of federal actions to the drivers of climate change (GHG emissions) and full consideration of how climate change will impact the cost and efficacy of planned management actions* - this should be required of all federal actions and should include comprehensive cost-benefit and GHG emission analyses of developing domestic energy sources on public lands so that the impacts of additional emissions are fully mitigated in NEPA. As an example, Congress can direct federal agencies to treat CO_2 and methane as a metric in NEPA.

(2). *Provide clear guidance to BLM and Forest Service on fossil fuel leasing, including a moratorium on new leases pending full mitigation of GHG emissions and watershed impacts* - leases for oil and gas development, in particular on BLM lands, have been handed out in record numbers in the last few years with little concern for environmental or atmospheric impacts (Exhibit C). Even though oil and gas development on federal lands has been rampant, most of these leases have not yet been developed. Their future development will hamper any attempts to meet the 350 ppm safety net, in addition to decreasing the resilience of fish and wildlife populations and ecosystem services to climate change. Once new oil and gas wells and their associated pads and roads are developed, their emissions and habitat impacts will continue for decades to centuries. As the agency is indicating it will allow additional oil and gas leasing across large areas (http://www.blm.gov/pgdata/etc/medialib/blm/nm/programs/0/og_sale_notices_and/2008.Par.48580.File.dat/April162008_SaleNotice.pdf), on top of the extensive areas already leased, a full accounting of emissions and ecosystem degradation from already developed

leases will allow agencies to implement mitigation and sequestration strategies. For undeveloped leases, Congress should require revocation of leases as developing these leases would increase GHG emissions.

(3). *The Forest Service should be given control to subsurface mineral development on the national forest system* - the Forest Service has yet to develop land-use plans for dealing with subsurface mining. While there is growing interest in developing domestic energy sources, the more we depend on fossil fuels, the more we will exceed the recommended 350 ppm safety net and create even greater risks to the nation. Federal agencies should shift production increasingly toward renewable energy sources. Areas already developed and degraded for oil and gas could make ideal sites for solar, wind, or other renewable energy projects.

(4). *Require agencies to analyze both costs and benefits, including GHG emissions, of all types of energy, biofuels, agriculture and forestry* - guidance is needed for agencies to assess a full range of alternatives before approving any federal action that would lead to a net increase in GHG emissions and that all net increases in GHG emissions should be offset elsewhere by increases in sequestration.

Biodiversity and Ecosystem Services:

(5). *Prioritize preservation and restoration of biological diversity and other ecosystem services* - on federal lands, priority ecosystem services largely include capture and storage of carbon, clean water, flood and drought abatement, biodiversity, and nutrient cycling. High priority actions include protecting roadless areas and undeveloped watersheds and reducing existing stressors by restoring degraded lands.

(6). *Require that agencies conduct assessments of ecosystem services and biodiversity potential of all ecosystems in the context of climate change* – this is essential in order to manage ecosystems for resistance and resilience to climate change.

(7). *Require the Secretaries of Interior and Agriculture to develop a connected system of lands and waters as a climate change refuge* – this system should be managed primarily for conservation of biological diversity, ecosystem services, and carbon sequestration while allowing for dispersal of native species. Protected areas are essential for maintaining viable fish and wildlife populations and high levels of genetic and species diversity, which would then be available to recolonize areas degraded by poor management or climate change. Roadless areas, riparian areas, old forests, and intact ecosystems are keys to this system.

(8). *Institute a regulatory requirement to conduct analyses of landscape connectivity when large-scale energy developments, particularly placement of energy corridors, are proposed for public lands* - this is needed to minimize fragmentation of fish and wildlife habitat.

Existing Laws and Regulations:

(9). *Congress should work with the Obama administration to override the Bush Administration's 2008 regulations regarding NFMA and reinstate the 1982 regulations pursuant to further review by a Committee of Scientists appointed by Congress or the administration* - the regulations should be rendered compliant with climate change response, fish and wildlife viability, and findings of previous science committees (COS 1999).

(10). *Revaluate and amend BLM's sustained yield and the Forest Service's multiple use mandates to be consistent with preserving biological diversity and ecosystem services in response to climate change* – land-use planning should explicitly be designed to achieve management goals under plausible future conditions with a clear objective of reducing existing stressors.

(11). *Require federal agencies to modify all land-use plans to be compliant with NEPA and other environmental statutes in the context of climate change* – this includes assessing cumulative effects of land-use practices (existing stressors) and climate change within the context of both mitigation and preparation.

Adaptive Management, Dedicated Funding, and Multi-jurisdictional Coordination:

(12). *As part of adaptive management, apply climate change and land-use models to address potential impacts of climate change and existing stressors* – this includes modeling effects on vegetation, hydrology, snow pack, fish and wildlife, fire, and forest productivity with a temporal extent of decades to a century (e.g., Exhibit A).

(13). *Direct federal agencies to cooperate and coordinate federal management plans across jurisdictions and provide incentives for technology transfer and climate preparation and sequestration on nonfederal lands* - significant outreach to private landowners, including timber companies and ranchers, will be needed to implement the 3-R's strategy and the 350 ppm GHG target across broader planning scales.

(14). *Provide dedicated funding to develop and implement climate change strategies on federal lands* – this includes increasing the number of scientists on the staff of agencies and supporting a National Science Center for Wildlife Adaptation (e.g., one such funding system was proposed in the previous Congress in S.2191, "America's Climate Security Act").

Congressman Grijalva as you and the Subcommittee contemplate legislation for public lands, we urge that public lands be managed for their irreplaceable contribution to biodiversity and ecosystem services by developing a national comprehensive plan to bring down and keep GHG emissions at safe levels, reduce our dependency on fossil fuels while developing renewable energy sources, and ensure the continuation of a biologically diverse and robust system of public lands. Thank you Mr. Chairman. That concludes my testimony.

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